

1 **CLAIMS**

2 I (We) claim:

3 1. A surgical device for producing work in the body comprising an implantable unit
4 including a transducer, said transducer having a dielectric polymer film disposed
5 between two electrodes, said electrodes connected to an electrical lead, said film
6 having an initial position with a first size and an excited position with a different second
7 size, said transducer accomplishing work resulting from said film transitioning from said
8 first position to said second position.

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10 2. A surgical device of claim 1 wherein said transducer is adapted to be placed within a
11 bone with said film in said initial position, said film expanding to said second different
12 position by electrical impulse applied to said electrodes through said lead, said film
13 returning to said first position upon cessation of said electrical impulse whereby said
14 transducer forms an internal cavity in the bone.

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16 3. A surgical device of claim 1 wherein said transducer is adapted to be placed within a
17 bone with said film in said initial position, said film expanding to said second different
18 position by electrical impulse applied to said electrodes through said lead whereby said
19 transducer forms an internal splint in the bone.

1 4. A surgical device of claim 1 wherein a pump is adapted to be implanted in the body,
2 said pump having an output port connected to a flexible reservoir of variable volume,
3 said reservoir adapted to be filled with a medicament, said reservoir having a refill port
4 for percutaneous refilling of said reservoir, said transducer in contact with said
5 reservoir, said film reducing the volume of said reservoir when transitioning from said
6 first position to said second position.

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8 5. A surgical device of claim 4 wherein said reservoir is adapted to be empty, said
9 outlet port is adapted to receive body fluids, said transducer in contact with said
10 reservoir with said film in said second position, said film transitioning from said second
11 position to said first position as said reservoir fills, said change in position generating an
12 electrical impulse through said electrodes and said electrical lead.

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14 6. A surgical device of claim 1 wherein said transducer is adapted to be inserted in the
15 intervertebral disk space in said second position, said capacitor accomplishing work by
16 transitioning from said first position to said second position by compression of said
17 intervertebral space and generating electrical impulse through said lead.

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19 7. In an orthopedic system having a guide wire for percutaneous penetration and
20 insertion through a bone having a cortical portion and a cancellous portion, a cannula
21 for telescoping insertion along said guide wire and penetration into the cancellous

1 portion of the bone, the improvement comprising an electroactive polymer sandwiched
2 between electrodes with an initial position of a size and shape for insertion through said
3 cannula into the cancellous portion of the bone, said electroactive polymer having
4 malleable properties including changes of size and shape, a source of electrical energy
5 for stimulating said electrodes, said electrodes having an electrical connection with said
6 source whereby activation of said source excites said electrodes causing said malleable
7 properties to change at least one of said size and said shape of said electroactive
8 polymer and alter the bone.

9
10 8. In an orthopedic system of claim 7 wherein at least one of said size and said shape
11 of said electroactive polymer expands and alters the cancellous portion to produce a
12 cavity in said cancellous portion.

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14 9. In an orthopedic system of claim 7 wherein upon cessation of said electrical
15 stimulation said electrodes returns said electroactive polymer to said initial position.

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17 10. In an orthopedic system of claim 7 wherein at least one of said size and said shape
18 expands to alter said cortical portion of the bone.

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20 11. In an orthopedic system of claim 8 wherein upon cessation of said electrical
21 stimulation said electroactive polymer returns to said initial position.

12. A transducer for insertion into a bone for altering the cancellous portion comprising an electroactive polymer with malleable properties sandwiched between opposing electrodes, said electroactive polymer having an initial position of a size and shape to be inserted into the cancellous portion of a bone, said malleable properties of said electroactive polymer changing in response to electrical stimulation, and an electrical energy source, said electrodes electrically connected to said source whereby activation of said source results in changed properties of said electroactive polymer and altered bone.

13. In an orthopedic system of claim 12 wherein upon cessation of said electrical stimulation said electroactive polymer returns to said initial position.

14. A method of forming a cavity within a bone having a cortical body and a cancellous interior comprising the steps of

a) inserting a cannula through the cortical body of a bone into said cancellous interior, said cannula including an aperture, a transducer spanning said aperture, said transducer having an initial position and a second position,

b) connecting said transducer to a source of electrical energy, and

c) said transducer transitioning to said second position, said second position being larger than said initial position

whereby said cancellous interior is compressed to form a cavity.

1 15. A method of forming a cavity of claim 14 comprising the steps of

2 a) providing a separate transducer with a frame,

3 b) depositing said transducer in said cancellous interior in said initial position, and

4 c) withdrawing said canulla.

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6 16. A method of infusing a medicament from a variable volume pump comprising the
7 steps of

8 a) providing a pump having a body with a reservoir and an infusion port connecting said
9 reservoir with said exterior of said body, a flexible diaphragm connected to said body in
10 said reservoir separating said reservoir into two chambers, a transducer in one
11 chamber, and a medicament in said second chamber,

12 b) said transducer having an initial position and a second position,

13 c) applying an electrical charge to said transducer,

14 d) said transducer transitioning from said initial position to said second larger position

15 whereby said first chamber is enlarged and said second chamber is decreased and said
16 medicament is expressed from said infusion port.

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18 17. A method of infusing a medicament of claim 16 comprising the steps of

19 a) providing said transducer as said diaphragm.